



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/589,399	08/14/2006	Guo-Quan Lu	124617.00118	7126
27557 7590 07/10/2009 BLANK ROME LLP WATERGATE 600 NEW HAMPSHIRE AVENUE, N.W. WASHINGTON, DC 20037				
EXAMINER TAKEUCHI, YOSHITOSHI				
ART UNIT		PAPER NUMBER		
1793				
MAIL DATE		DELIVERY MODE		
07/10/2009		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/589,399

**Applicant(s)**

LU ET AL.

**Examiner**

YOSHITOSHI TAKEUCHI

**Art Unit**

1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 15 April 2009.  
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-20 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 14 August 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)  
3) ☒ Information Disclosure Statement(s) (PTO-85/86)  
Paper No(s)/Mail Date 15 April 2009  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_  
5) ☐ Notice of Informal Patent Application  
6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
2. Claims 1-3 and 5-13 are rejected under 35 U.S.C. 103(a) as obvious over Basol (US 2004/0219730).
  - a. Regarding claims **1-3**, Basol teaches a composition (abstract) comprising: a silver nano-powder composed of a plurality of silver (§ 0041) particles of a particle size of less than about 200 nm, and preferably less than about 100 nm (§ 0035); a dispersant associated with particles of the metal or metal alloy powder (§ 0036), said dispersant being present in sufficient quantity to reduce or prevent agglomeration of said particles of the metal or metal alloy powder (presumed, since that is the function of a dispersant); and a binder having a temperature of volatilization below the sintering temperature of said metal or metal alloy powder (§ 0037).

Basol does not expressly teach a method “for forming an interconnect,” but it would have been obvious to a person of ordinary skill at the time of the invention to use the method of Basol to make an interconnect because Basol teaches a method of adding a thin layer of metallic nano-particles for electrical devices, where adding a thin layer of metallic nano-particles would be advantageous to minimize the size of an interconnect.
  - b. Regarding claim **5**, Basol teaches the composition of claim 1, wherein said binder is a polymeric material (§ 0038, a polymeric material implied from, the teaching that the

binder be preferably a "volatile material that once evaporated out of the wet micro-layer, leaves substantially no residue behind that would have deleterious effect").

c. Regarding claim 6, Basol teaches the composition of claim 1 further comprising a carrier, which would adjust the viscosity of the composition (§ 0038).

d. Regarding claims 7, 10 and 12, Basol teaches a method comprising the step of: sintering (§ 0040) silver (§ 0041) particles of a particle size of less than about 200 nm, and preferably less than about 100 nm (§ 0035), which are positioned on contacts on the device and the substrate (§ 0009 and Figure 4, item 42) and sandwiched therebetween; and said sintering step forming a metal or metal alloy layer from said metal or metal alloy particles (abstract).

Basol does not expressly teach a method "for forming an interconnect which performs at least one of mechanically, thermally or electrically connecting a device to a substrate," but it would have been obvious to a person of ordinary skill at the time of the invention to use the method of Basol to make an interconnect because Basol teaches a method of adding a thin layer of metallic nano-particles for electrical devices, where adding a thin layer of metallic nano-particles would be advantageous to minimize the size of an interconnect.

e. Regarding claim 8, Basol teaches the method of claim 7 further comprising the step of depositing on at least one electrical contact of at least one of the device and the substrate said metal or metal alloy particles (Figure 4 and § 0030).

f. Regarding claim 9, Basol teaches the method of claim 8 wherein said step of depositing is performed by screening, printing or stenciling (§ 0037).

g. Regarding claim 11, Basol teaches the method of claim 7 further comprising the step of holding the device and the substrate together during the step of sintering (presumed since the two are kept together. Natural forces, such as gravity, would hold the two together).

Alternatively, it would have been obvious to hold the device and substrate together during sintering to provide the desired adhesion (i.e. avoid shifting) of the device and the substrate.

h. Regarding claim 13, Basol teaches the method of claim 7 wherein said metal or metal alloy, prior to said step of sintering, is present in the form of a paste which comprises a dispersant associated with the metal or metal alloy particles, said dispersant being present in sufficient quantity to reduce or prevent agglomeration of said metal or metal alloy particles, and a binder having a temperature of volatilization below the sintering temperature of said metal or metal alloy particles (§ 0036-37).

***Claim Rejections - 35 USC § 103***

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
4. Claims 4 and 14-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Basol (US 2004/0219730) in view of Kodas et al (US 2003/0108644).
  - a. Regarding claim 4, Basol teaches the composition of claim 1, wherein the dispersant be a well-known dispersants (§ 0036), but does not teach the dispersant being a fatty acid or a fish oil

Kodas teaches a method for forming recessed electrical features, such as interconnects, using silver nano-particles (abstract). Kodas uses fish oil as a dispersant (§ 0260).

As a result, it would have been obvious to a person of ordinary skill at the time of the invention to use the fish oil, as taught by Kodas, as the dispersant of Basol, because Basol taught the use of any well-known dispersant (§ 0036-37) and Kodas teaches fish oil is known as a type of dispersant.

b. Regarding claims **14-16** and **18**, Basol teaches a method comprising the step of: positioning a paste which comprises a silver (§ 0041) powder composed of a plurality of particles of a particle size of less than about 200 nm, and preferably less than about 100 nm (§ 0035); dispersant associated with particles of the metal or metal alloy powder (§ 0036), said dispersant being present in sufficient quantity to reduce or prevent agglomeration of said particles of the metal or metal alloy powder (presumed, since that is the function of a dispersant); a binder having a temperature of volatilization below the sintering temperature of said metal or metal alloy powder (§ 0037); heating said paste to a temperature and for a time sufficient to remove said binder and said dispersant (§ 0038, a polymeric material implied from, the teaching that the binder be preferably a "volatile material that once evaporated out of the wet micro-layer, leaves substantially no residue behind that would have deleterious effect"); and to sinter metal particles of said metal or metal alloy powder together to form a metal or metal alloy layer from said metal or metal alloy particles which performs at least one of mechanically, thermally, or electrically interconnecting the device and the substrate (§ 0040).

Kodas teaches a paste for connecting a substrate and a device (§ 360) and also positioning said paste between contacts of said substrate and said device (§ 360)

c. Regarding claim 17, Basol teaches the method of claim 14 wherein said positioning step is performed by stenciling, printing, or screening (§ 0037).

d. Regarding claims **19-20**, Basol teaches the method of claim 14 further comprising the step of isolating said metal or metal alloy particles with said binder until a preset temperature during said heating step, wherein said preset temperature is determined based on said binder and a sintering temperature for said metal or metal alloy particles, wherein said preset temperature is the same as or slightly below a sintering temperature for said metal or metal alloy particles (§ 0040).

#### ***Response to Arguments***

5. Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection.

#### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YOSHITOSHI TAKEUCHI whose telephone number is (571) 270-5828. The examiner can normally be reached on Monday-Thursday 9:30-3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dr. Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Roy King/  
Supervisory Patent Examiner, Art Unit  
1793

/YOSHITOSHI TAKEUCHI/  
Examiner, Art Unit 1793